

$$\underline{23)} \quad x = 1, -1, -2$$

$$(x-1)(x+1)(x+2)$$

$$(x^2 + \cancel{x} \cancel{x} - 1)(x+2)$$

$$(x^2 - 1)(x+2)$$

$$\boxed{y = x^3 + 2x^2 - x - 2}$$

Bellwork: 2/20/13

Find the polynomial given the following roots:

$$x = 2, -3, 4/5$$

$$(x-2)(x+3)(5x-4)$$

$$(x^2+x-6)(5x-4)$$

$$~~5x^3 + 5x^2 - 30x - 4x^2 - 4x + 24~~$$

$$y = 5x^3 + x^2 - 34x + 24$$

Section 5.4 - Synthetic Division

Synthetic Division simplifies the long division process for dividing polynomials.

To use synthetic division, write the coefficients (including zeros) of the polynomial in standard form. For the divisor, use the value for "x" that is a solution of the function and



example 1: Divide $x^3 - 14x^2 + 51x - 54$ by $x + 2$ $x + 2 = 0$
 $x = -2$

$$\begin{array}{r|rrrr} -2 & 1 & -14 & 51 & -54 \\ & + \downarrow & -2 & 32 & -166 \\ \hline & 1 & -16 & 83 & -220 \end{array}$$

$$\boxed{x^2 - 16x + 83 \text{ R} -220}$$

example 2: Divide $x^3 - 57x + 56$ by $x - 7$ $\rightarrow x - 7 = 0$
 $x = 7$

$$| x^3 + 0x^2 - 57x + 56$$

$$\begin{array}{r|rrrr} 7 & 1 & 0 & -57 & 56 \\ + \downarrow & & 7 & 49 & -56 \\ \hline & 1 & 7 & -8 & 0 \end{array}$$

$x^2 + 7x - 8$

example 3: Divide $x^3+5x^2+11x+15$ by $x+3$

$$\begin{array}{r} \underline{-3} \overline{) \quad 1 \quad 5 \quad 11 \quad 15} \\ + \downarrow \quad -3 \quad -6 \quad -15 \\ \hline 1 \quad 2 \quad 5 \quad \boxed{0} \end{array}$$

$$\boxed{x^2 + 2x + 5}$$

example 4: Divide $x^3 - x^2 - 4x + 4$ by $x - 2$

example 5: Divide $4x^3+21x^2-x-24$ by $x+5$

$$\begin{array}{r} \underline{-5} \overline{) \quad 4 \quad 21 \quad -1 \quad -24} \\ + \downarrow \quad -20 \quad -5 \quad 30 \\ \hline 4 \quad 1 \quad -6 \quad \boxed{6} \end{array}$$

$$\boxed{4x^2 + x - 6 \text{ R}6}$$

example 6: Divide $x^4 - 2x^3 + x^2 + x - 1$ by $x - 1$

$$\begin{array}{r|rrrrr} 1 & 1 & -2 & 1 & 1 & -1 \\ + \downarrow & & 1 & -1 & 0 & 1 \\ \hline & 1 & -1 & 0 & 1 & \boxed{0} \end{array}$$

$$x^3 - x^2 + 0x + 1$$

$$\boxed{x^3 - x^2 + 1}$$

